

RELIABILITY REPORT  
FOR

DS1087L, Rev A2

Dallas Semiconductor

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Prepared by:

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**Conclusion:**

The following qualification successfully meets the quality and reliability standards required of all Dallas Semiconductor products and processes:

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In addition, Dallas Semiconductor's continuous reliability monitor program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards. The current status of the reliability monitor program can be viewed at <http://www.maxim-ic.com/TechSupport/dsreliability.html>.

**Device Description:**

A description of the device used in this qualification can be found in the product data sheet. You can find the product data sheet at [http://dbserv.maxim-ic.com/l\\_datasheet3.cfm](http://dbserv.maxim-ic.com/l_datasheet3.cfm).

**Reliability Derating:**

The Arrhenius model will be used to determine the acceleration factor for failure mechanisms that are temperature accelerated.

$AfT = \exp((Ea/k) * (1/Tu - 1/Ts)) = tu/ts$   
AfT = Acceleration factor due to Temperature  
tu = Time at use temperature (e.g. 55°C)  
ts = Time at stress temperature (e.g. 125°C)  
k = Boltzmann's Constant ( $8.617 \times 10^{-5}$  eV/°K)  
Tu = Temperature at Use (°K)  
Ts = Temperature at Stress (°K)  
Ea = Activation Energy (e.g. 0.7 eV)

The activation energy of the failure mechanism is derived from either internal studies or industry accepted standards, or activation energy of 0.7eV will be used whenever actual failure mechanisms or their activation energies are unknown. All deratings will be done from the stress ambient temperature to the use ambient temperature.

An exponential model will be used to determine the acceleration factor for failure mechanisms, which are voltage accelerated.

$AfV = \exp(B * (Vs - Vu))$   
AfV = Acceleration factor due to Voltage  
Vs = Stress Voltage (e.g. 7.0 volts)  
Vu = Maximum Operating Voltage (e.g. 5.5 volts)  
B = Constant related to failure mechanism type (e.g. 1.0, 2.4, 2.7, etc.)

The Constant, B, related to the failure mechanism is derived from either internal studies or industry accepted standards, or a B of 1.0 will be used whenever actual failure mechanisms or their B are unknown. All deratings will be done from the stress voltage to the maximum operating voltage. Failure rate data from the operating life test is reported using a Chi-Squared statistical model at the 60% or 90% confidence level (Cf).

The failure rate, Fr, is related to the acceleration during life test by:

$Fr = X / (ts * AfV * AfT * N * 2)$   
X = Chi-Sq statistical upper limit  
N = Life test sample size

Failure Rates are reported in FITs (Failures in Time) or MTTF (Mean Time To Failure). The FIT rate is related to MTTF by:

$$\text{MTTF} = 1/\text{Fr}$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process/assembly is:

**FAILURE RATE:**                      **MTTF (YRS): 19111**                      **FITS: 6.0**

The parameters used to calculate this failure rate are as follows:

**Cf: 60%**                      **Ea: 0.7**                      **B: 0**                      **Tu: 25 °C**                      **Vu: 5.5 Volts**

The reliability data follows. At the start of this data is the device information. This is a description of the device for this report. Following this is the assembly information. This section includes a description of the assembly vehicle used to generate this reliability data for both qualifications and monitors. The next section is the detailed reliability data for each stress found in the qualification / monitor. If there are additional assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that assembly. The reliability data section includes the latest data available. Some of this data may be generic with other products.

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#### Device Information:

Process: D6W-2P2M,HPVt,E2,EPROGVt,TCN3 ALOCOS:GOI  
Passivation: Passivation w/Nov TEOS Oxide-Nitride  
Die Size: 58 x 84  
Number of Transistors: 8000  
Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
Gate Oxide Thickness: 150 Å

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#### Assembly Information:

Qualification Vehicle: DS1086L  
Assembly Site: ATP (Amkor, PI)  
Pin Count: 8  
Package Type: SOIC  
Body Size: 150x1.4  
Mold Compound: Nitto MP8000 w/BCB4026 Die Coat level 1  
Lead Frame: Stamped Copper CDA194  
Lead Finsh: SnPb Plate  
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 1  
Date Code Range: 0348 to 0348

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#### ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0348		EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0348		EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0348		EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0348		EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0348		EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	3	No FA

LATCH-UP	0348	JESD78, I-TEST 125C	2	DYS	6	0
LATCH-UP	0348	JESD78, Vsupply TEST 125C	2	DYS	6	0
<b>Total:</b>					<b>3</b>	

#### OPERATING LIFE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0348		125C, 3.5 VOLTS	1000 HRS	77	0	
<b>Total:</b>						<b>0</b>	

#### PRECONDITIONING LEVEL 1

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0348		125C	24 HRS	400		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	400		
CONVECTION REFLOW			235C +5/-0C	3 PASS	400	0	
<b>Total:</b>						<b>0</b>	

#### TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0348		-55C TO 125C	1000 CYS	77	0	
<b>Total:</b>						<b>0</b>	

#### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0348		130C, 85%R.H.,5.5V	96 HRS	77	0	
<b>Total:</b>						<b>0</b>	

#### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0348		121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
<b>Total:</b>						<b>0</b>	

#### W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS	0348		70 C, 3.6 VOLTS	10 KCYS	77	0	
STORAGE LIFE			150C	1000 HRS	77	0	
<b>Total:</b>						<b>0</b>	

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**Assembly Information:**

Qualification Vehicle: DS1087L  
Assembly Site: ATP (Amkor, PI)  
Pin Count: 8  
Package Type: SOIC  
Body Size: 150x1.4  
Mold Compound: Nitto MP8000 w/BCB4026 Die Coat level 1  
Lead Frame: Stamped Copper CDA194  
Lead Finish: SnPb Plate  
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 1  
Date Code Range: 0321 to 0333

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**ELECTRICAL CHARACTERIZATION**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0321		EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0321		EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0321		EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0321		EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	3	No FA
ESD SENSITIVITY	0321		EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	3	No FA
LATCH-UP	0321		JESD78, I-TEST 125C	2 DYS	6	0	
LATCH-UP	0321		JESD78, Vsupply TEST 125C	2 DYS	6	0	
Total:						6	

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0333		125C, 3.5 VOLTS	1000 HRS	77	0	
Total:						0	

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**PRECONDITIONING LEVEL 1**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0333		125C	24 HRS	393		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	393		
CONVECTION REFLOW			235C +5/-0C	3 PASS	393	0	
Total:						0	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0333		-55C TO 125C	1000 CYS	77	0	
Total:						0	

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**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0333		130C, 85%R.H.,3.5V	96 HRS	77	0	
Total:						0	

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**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0333		121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
				<b>Total:</b>		<b>0</b>	

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**W/E ENDURANCE AND DATA RET'N**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS	0333		70 C, 3.6 VOLTS	5 KCYS	77	0	
STORAGE LIFE			150C	1000 HRS	76	0	
				<b>Total:</b>		<b>0</b>	

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**Assembly Information:**

Qualification Vehicle: DS1094L  
Assembly Site: ATP (Amkor, PI)  
Pin Count: 8  
Package Type: uSOP  
Body Size: 3x0.85  
Mold Compound: Nitto MP8000 w/BCB4026 Die Coat  
Lead Frame: Stamped Copper C7025  
Lead Finsh: SnPb Plate  
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Moisture Sensitivity  
(JEDEC J-STD20A) Level 1  
Date Code Range: 0413 to 0413

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**ELECTRICAL CHARACTERIZATION**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0413		EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0413		EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0413		EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0413		EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	1	No FA
ESD SENSITIVITY	0413		EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	3	No FA
LATCH-UP	0413		JESD78, I-TEST 125C	2 DYS	6	0	
LATCH-UP	0413		JESD78, Vsupply TEST 125C	2 DYS	6	0	
				<b>Total:</b>		<b>4</b>	

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0413		125C, 3.6 VOLTS	192 HRS	45	0	
				<b>Total:</b>		<b>0</b>	

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**PRECONDITIONING LEVEL 1**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0413		125C	24 HRS	306		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	306		
CONVECTION REFLOW			235C +/-0C	3 PASS	306	0	
				<b>Total:</b>		<b>0</b>	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0413		-55C TO 125C	1000 CYS	77	0	
				<b>Total:</b>		<b>0</b>	

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**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0413		121C, 2 ATM STEAM, UNBIASED	168 HRS	85	0	
				<b>Total:</b>		<b>0</b>	

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**W/E ENDURANCE AND DATA RET'N**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS	0413		70 C, 3.6 VOLTS	10 KCYS	77	0	
STORAGE LIFE			150C	96 HRS	75	0	
				<b>Total:</b>		<b>0</b>	

**FAILURE RATE:**                      **MTTF (YRS): 19111**                      **FITS: 6.0**